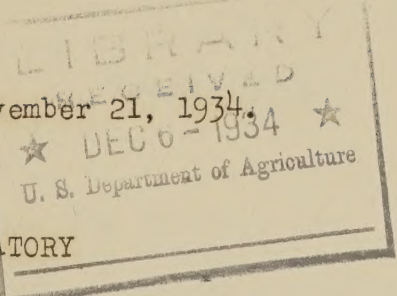


Historic, Archive Document

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En 35P

November 21, 1934.



SPECIFICATIONS FOR A
POWER CAR
FOR THE FARM TILLAGE MACHINERY LABORATORY
LOCATED AT THE
ALABAMA AGRICULTURAL EXPERIMENT STATION
AUBURN, ALABAMA
FOR THE
UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF AGRICULTURAL ENGINEERING
(F.P.-92)

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GENERAL CONDITIONS

General -- These specifications and the accompanying drawings are intended to include the furnishing of all labor, materials, transportation, tools and equipment required for the construction of one (1) Power Car (F.P.-92) complete in every respect and including the power unit, main frame, traveling super-frame, cranes, etc., all as shown on the drawings and herein specified. The car shall be fabricated and assembled complete in the shop for final shop inspection and shall then be knocked down, crated in a satisfactory manner, delivered and reassembled at the site in Auburn, Alabama ready for final working test.

The Government will furnish, to the contractor without charge, electric current necessary in reassembling the car at the site. Current available for use will be 110/220 single phase and 220 three phase, 60 cycle, A. C. Transformers 7 1/2 K.V.A.

The Government will also provide adequate space in the storage part of the Laboratory Building at site where the contractor may reassemble the car and will also furnish the necessary means of moving car from the building to the soil plot rails where final test will be made. The storage space in building is provided with 8 x 10 inch H-beam track rails similar to those used on soil plots, and a 2 ton overhead electric crane with a hook height of 5' 9" above the top of the rail. This crane will be available for use by the contractor in assembling the Power Car. The total weight of the Power Car shall be approximately 8 tons.

It is the intent of these specifications to describe a motor assembly, such as is used in the driving of a heavy motor truck, mounted on the special built frame of the car complete with other equipment and accessories all as shown on the drawings and herein specified.

This car is to be designed to operate on 8 x 10 inch H-beam rails (furnished and installed by others) spaced 21' 2" on centers, and is to be used in connection with the experimental work of the Farm Tillage Machinery Laboratory located at Auburn, Alabama.

In the design, construction and assembly of this Power Car, the contractor is advised that rigid inspection and tests will be made prior to acceptance due to the fact that the car will be used for scientific purposes. Vibration and deflection in any of its parts must be kept at a minimum so as not to affect the accuracy of the readings of a dynamometer which will be located on the car. The dynamometer will be furnished and installed under a separate contract.

In general, it is the intent of the specifications to state the service required or method of operation and the types and qualities of materials and workmanship to be furnished, but to permit the contractor to use such methods of fabrication as he may elect, subject to approval by the Bureau. The Bureau will advise and cooperate with the contractor in every way possible to the end that the progress of the work may be expedited and that the work as a whole may be satisfactorily completed; and it is expected that the contractor will facilitate and reciprocate such advice and cooperation.

MEMORANDUM

TO : THE SECRETARY OF THE ARMY
FROM : THE CHIEF OF THE ARMY
SUBJECT: [Illegible]

1. [Illegible]

2. [Illegible]

3. [Illegible]

4. [Illegible]

5. [Illegible]

6. [Illegible]

Drawings Accompanying Specifications -- The following drawings accompany these specifications and will form a part of the contract. Wherever "as shown", "as indicated", "as detailed", or words of similar import are used, it shall be understood that reference to these drawings is made unless stated otherwise. Drawings are the property of the Government and shall not be used for any purpose other than that contemplated by the specifications. Power Car, Serial No. 2872:

Frame Assembly	Sheet 1 of 6
Super Frame Arrangement	" 2 " 6
Location of Equipment	" 3 " 6
Super Frame & Chart Drive ...	" 4 " 6
Assembly Details	" 5 " 6
Circuit Breaker & Main Wheel	" 6 " 6

Definition of Terms -- In these specifications and in related forms, the intent and meaning of the following terms shall be interpreted as follows:

Secretary - The Secretary of the United States Department of Agriculture.

Contracting Officer - The Officer who signs the contract upon behalf of the Government, and shall include his duly appointed successor or his authorized representative.

Chief of Bureau - The Chief of the Bureau of Agricultural Engineering of the Department of Agriculture, who is hereby designated an authorized representative of the Contracting Officer.

Inspector - An authorized representative of the Government, assigned to make any or all necessary inspections of materials furnished and work performed by the contractor.

Bid Guarantee -- Guarantee will be required with each bid to insure the execution of the contract and no bid will be considered unless it is so guaranteed. The bidder at his option may furnish a guaranty bond, a certified check, or United States bonds in amount not less than 5 per cent of amount of bid.

Performance Bond -- The successful bidder shall execute a Standard Government Form of Contract, and shall furnish a satisfactory bond, in amount not less than 100 per cent of the contract price, executed upon the standard form No. 25 in use by the Government, insuring the fulfillment of all provisions of the contract and the prompt payment of persons furnishing labor and materials in the prosecution of the work.

Time for Completion -- The work shall be completed within 100 calendar days after date of receipt of notice to proceed therewith.

The time of completion will not be construed as including the period or periods during which shop drawings are in the hands of the

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Department officer for examination and approval, or the transit time required for the return of the approved drawings from the Department to the contractor, or the time consumed in transportation of the finished car and equipment from shipping point to Auburn, Alabama.

Liquidated Damages -- Damages for delay in the completion of the contract, in accordance with Article 9 of the United States Government Form of Contract No. P.W.A.51 (Federal Emergency Administration of Public Works Projects), shall be at the rate of \$25.00 per calendar day.

Payments -- Partial payment, in the amount of 80 per cent of the contract price, will be made upon delivery of the car to the site. The balance of the contract price will be made after final inspection and acceptance in accordance with the contract requirements.

Specifications and Drawings -- Discrepancies, errors, or omissions noted by intended bidders in the specifications and on the drawings should be reported promptly to the Chief of the Division of Purchase, Sales and Traffic, U. S. Department of Agriculture for correction or interpretation before the date of opening of the bids.

Large scale drawings shall, in general, govern small scale drawings, and figures marked on drawings, shall, in general, be followed in preference to scale measurements, but the successful bidder, before laying out the work, shall compare all drawings and verify the figures, and will be held responsible for any work improperly executed.

Shop Drawings -- The contractor shall submit copies, in triplicate, of shop details, layouts, etc., to the Chief of the Bureau (or his designated representative) and his approval obtained before proceeding with the work. When approved, one set of the prints will be returned to the contractor so marked. When changes or corrections are necessary, one set will be returned to the contractor so noted and he shall proceed as before with the submission of revised prints.

Shop drawings shall be numbered and shall be accompanied by a letter of transmittal giving a list of the numbers. Each drawing shall be marked with the name of the job and name of the contractor. If the shop drawings show variations from the contract requirements because of standard shop practice or other reason, the contractor shall make specific mention of such variations in his letter of submission.

The approval of shop drawings will be general and will not relieve the contractor from the responsibility for proper fitting and construction of the work nor from furnishing materials and work required by the contract which may not be indicated on the shop drawings when approved.

Federal Specifications -- The Federal specifications referred to herein shall form a part of these specifications. Materials so specified shall conform to the technical requirements of the respective Federal specifications referred to or the latest edition thereof. Federal specifications are not furnished to bidders or contractors, as they were prepared in collaboration with manufacturers and producers who are assumed to be familiar with their requirements. Copies of Federal specifications which bidders or contractors may require may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C.

The contractor should exercise especial care to refer, in requests for quotations in orders, and in subcontracts, to these Federal specifications.

Proprietary Articles -- Trade names mentioned herein are used for descriptive purposes only, as indicative of the class of material desired. Bidders may base their proposals upon similar articles if they are equal in appearance and quality and meet the specifications in all respects.

Inspection and Tests -- An inspection will be made after all work under the contract is completely assembled at the shop before shipment. The contractor shall notify the Chief of the Bureau in writing that the work will be ready for inspection on a definite date which shall be stated in the letter. The notice shall be given from 5 to 7 days prior to the date chosen. The unit shall not be crated for shipment until it has been approved by the Inspector.

A final inspection and test will be made after the car has been delivered, reassembled and set up on the soil plot rails at the site. In the final test the car will be required to pull a drawbar load of 3500 pounds at any position of the super-frame and the governor to maintain this speed within reasonable limits with variations in load of plus or minus 20%.

Contractor's Responsibility for Work -- Until the delivery and final acceptance of the work, as evidenced in writing, the contractor shall have charge and care thereof and shall take every necessary precaution against injury or damage to any part of the work by action of the elements or from any other source.

Patents -- The contractor shall hold and save the Government, its officers, agents, servants and employees, harmless from liability of any nature or kind, including costs and expenses, for or on account of any patented or unpatented invention, article, or appliance manufactured or used in the performance of this contract, unless otherwise specifically stipulated in this contract.

Removal of Debris, Cleaning, Etc. -- Upon completion and assembly of the work and before acceptance, the contractor shall remove all his tools, materials, debris, etc., from the property of the Government and leave the premises neat and clean to the satisfaction of the Inspector.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the transparency and accountability of the organization. The text also mentions the need for regular audits to ensure that the records are up-to-date and correct.

2. The second part of the document outlines the procedures for handling financial matters. It details the steps involved in budgeting, spending, and reporting. The text stresses the importance of adhering to established financial policies and procedures to avoid any mismanagement of funds.

3. The third part of the document addresses the issue of personnel management. It discusses the roles and responsibilities of various staff members and provides guidelines for hiring, training, and evaluating employees. The text also mentions the importance of maintaining a positive work environment and promoting teamwork.

4. The fourth part of the document focuses on the organization's relationship with its stakeholders. It discusses the importance of communication and collaboration with external parties, such as suppliers, customers, and regulatory bodies. The text also mentions the need for the organization to be responsive to the needs and concerns of its stakeholders.

5. The fifth part of the document discusses the organization's commitment to social responsibility. It outlines the various initiatives and programs that the organization has implemented to support the community and the environment. The text also mentions the importance of reporting on the organization's social performance.

6. The sixth part of the document provides a summary of the key points discussed in the previous sections. It reiterates the importance of transparency, accountability, and ethical conduct in all aspects of the organization's operations. The text also mentions the need for continuous improvement and innovation to ensure the organization's long-term success.

7. The seventh part of the document discusses the organization's future plans and goals. It outlines the strategic vision and the key objectives that the organization aims to achieve in the coming years. The text also mentions the importance of monitoring and evaluating the progress of these plans and goals.

8. The eighth part of the document provides a conclusion and a call to action. It encourages all members of the organization to work together to achieve the common goals and to maintain the highest standards of integrity and excellence. The text also mentions the need for ongoing communication and collaboration to ensure the organization's success.

9. The ninth part of the document is a list of references and sources. It includes a list of books, articles, and other documents that were consulted during the preparation of the document. The text also mentions the importance of citing sources properly to give credit to the original authors.

10. The tenth part of the document is a list of appendices. It includes a list of tables, figures, and other supplementary materials that are provided for the reader's reference. The text also mentions the importance of these materials in providing a more detailed and comprehensive understanding of the organization's operations.

Patterns -- All patterns for special castings used in the manufacture of special parts under this contract shall become the property of the Government and the contractor shall deliver same to the Department's representative at the site within 60 days after completion and acceptance of the contract without additional expense to the Government.

Guaranty -- "All work under this contract shall be guaranteed against defective material and workmanship for the period of one year from the date of final settlement. The Government, whose decision in all cases shall be final, reserves the right under this contract to repair any breakage due to defective workmanship and materials and to collect resulting costs from the contractor."

FRAMES

General -- The main frame and super-frame shall be of structural steel shapes, strongly braced and reinforced as indicated on drawings. Connections shall be riveted or welded but bolted as noted, and fabricated in accordance with best modern shop practice. Overall dimensions given shall in general govern all other dimensions. Welding or riveting may be used if practical wherever either type of connection was shown on the drawing.

Materials -- Structural steel shall conform with the requirements of Federal Specification No. QQ-S-721 for structural steel for buildings, Classes A and C. It shall be clean and free from mill scale, flake rust or rust pittings.

Iron Castings shall be tough grey iron, true to pattern, clean and free from injurious flaws and defects, and shall conform to Federal Specification No. QQ-1-651.

Steel Castings, unless otherwise specified, shall conform to Federal Specification No. QQ-S-681.

Welding Rod shall conform to requirements of Federal Specification QQ-W-351.

Workmanship -- All welds shall be continuous and full fillet type. Welding shall be in accordance with the recommendations of the American Welding Society.

All rivets shall be machine driven in the shop and shall have well finished concentric heads in full contact with the metal. Rivets shall completely fill the hole, shall be tight when set and, unless otherwise specified, shall be $3/4$ inch in diameter.

Bolts, unless otherwise indicated or specified, shall be $3/4$ inch in diameter, fitted in reamed holes. The finished shank shall be long enough to provide full bearing and lock washers shall be used under the nuts to give full grip when turned tight.

All steel shapes used shall be finished straight and, where required, shall be machined true. No change of size or shape of any structural member shall be made without first obtaining the approval of the Bureau.

The diameter of the punch shall not exceed that of the rivet, nor the diameter of the die that of the punch by more than $1/16$ inch, except as noted, and all holes shall be clean cut and without ragged or torn edges. The holes for bolting the bearing housings and for attaching the main frame to the wheel frame shall be subdrilled or punched and reamed to size with the members to be connected in place to take fitted bolts.

Gusset plates for main structural members shall be not less than $3/8$ inch thick, unless otherwise indicated.

Draw Bar -- shall be adequately braced and mounted under the main frame as shown and shall be capable of withstanding a drawbar load of 5000 pounds applied through the superframe and connecting link, without appreciable deflection.

The dynamometer draw bar heads on both sides of superframe shall be connected together by suitable horizontal linkage, the center of which shall be hitched to draw bar. The dynamometers are to be mounted on a frame with guides 25" long which in turn slide in the recesses of the 4" ship channels. All contact surfaces of moving parts shall be machined true and smooth.

All field connections made necessary on account of transportation of the car between the shipping point and the site shall be made with extreme care by means of fitted bolts. Bolts removed in shop shall be replaced in the field in the same holes from which they came.

When assembled, axle and shaft bearings shall be in true alignment. Wheels on one side of each frame shall be in a true line and parallel with wheels on opposite side.

Subframes for supporting engine and transmission and so forth shall be furnished by the contractor and shall be placed between the two 8" channels through the center of car. The design of these subframes shall be adequate for loads imposed but must be approved by the Bureau.

Wood platforms where indicated shall be built-up of $1\frac{1}{4}$ " x 8" edge grain oak planks, and shall be bolted to frame with $5/16$ " carriage bolts, two at each end of each plank. Lock washers shall be provided between nut and metal frame.

Detail Requirements -- The superframe shall be moved manually by means of hand wheels, rack rods and worm gears located on both sides of the power unit. Jaw clutches shall be provided between the worm gear and gear on rack rod so that either or both drives may be disengaged.

Suitable provision shall be made on both ends of the superframe for the mounting of a dynamometer and other recording instruments not a part of this contract but necessary in the experimental work to be performed by this car.

The superframe shall be capable of withstanding a draw bar pull load of 5000 pounds in addition to a dead load of 2000 pounds supported upon either crane 6 feet from the dynamometer draw bar head attachment.

Cranes, mounted on each end of superframe shall be of the design and type shown. Boom cable shall be hand adjusted by means of $7/16$ inch chain through keyholed slot in mast. Operation of cranes shall be manually by means of worm and gears as indicated or spur gears, in either case so that a hook load of 2000 pounds may be raised using not more than a 50 pound force on hand wheel. All parts of crane shall be designed for a total load of 2000 pounds using a factor of safety of five.

Steel cable shall be best quality flexible wire rope uncoated consisting of not less than six strands of nineteen wires each wound around a fiber core and of ample strength for the load required. Hook shall be Class d and chain shall be Type A, Class 1, Grade 1, in accordance with Federal Specification RR-C-271.

POWER UNIT ASSEMBLY

General -- The power car, under normal working conditions, shall be capable of moving at any speed from .2 to 10 miles per hour in a forward direction and .2 to $2\frac{3}{4}$ miles per hour in the reverse direction.

Controls for gear shift, clutch and brake, are to be extended to a point near the operator to permit him to conveniently operate these controls. All gages and instruments are to be located so as to be easily visible to the operator.

Standard commercial parts shall be used in the construction where practicable. The contractor shall furnish to the Inspector a complete set of printed instructions for operating the unit, and an itemized list of all parts giving the manufacturer's name and catalog number for each commercial unit used.

The car shall be provided with a complete set of any special tools necessary for repair or adjustment of equipment furnished. A suitable hood of standard type of construction shall be provided over the power unit. Exhaust pipe and automobile type muffler shall be provided, the exhaust to be carried to a point just outside the drive wheels on the engine side of car.

Power Unit -- The power unit shall consist of a gasoline engine, clutch and transmission embodied in a unit power plant and mounted on main car frame as indicated on drawings. It is intended that motor shall be mounted in the same manner as in a standard motor truck and have the same freedom of oscillation. Any additional structural members necessary to obtain proper rigidity between motor and frame or to meet the manufacturer's standard equipment requirements shall be supplied without additional expense to the Government.

Engine -- The engine shall be of the internal combustion, 4-cycle, multi-cylinder type, (having not less than 6 cylinders) and using gasoline as fuel. The crank shaft shall be statically and dynamically balanced.

The engine shall be of a current model capable of developing at least 135 brake horsepower at not more than 2600 r.p.m., and shall be similar to International model FEB or equal.

The engine and governor arrangement must be capable of operating speeds up to 25 per cent above normal for short periods to make possible the speeds up to 10 miles per hour.

Tachometers -- The engine shall be equipped with Tachometers showing both the r.p.m. of motor and of the drive shaft from transmission. Tachometers shall be of the indicator type with indicators mounted on instrument panel. The tachometer on engine may be of the single range type reading from minimum to maximum speed. The tachometer on drive shaft shall be of the 3 or 4 range type with the full scale reading for slow speed up to 200 r.p.m. in graduations of 5 r.p.m. and other ranges to cover up the maximum r.p.m. of engine.

Cooling System -- The cooling system shall be of the force-feed type, using a pump as a circulating agent. The radiator, cylinder jacket, cylinder head, water pump, and fan must be of ample capacity to keep the engine at a temperature that will insure economical operation for the conditions to be encountered. Flow of water through engine shall be thermostatically controlled so as to keep engine operating temperature as near optimum as possible.

Lubricating System -- Lubrication of the engine shall be of the force-feed and splash gravity force-feed or full force-feed type. Oil to be circulated by a positive driven pump located in crank case. Flexible lines shall be provided from the crank case to oil gage on instrument panel, and to the oil filter.

All bearings not otherwise specified shall be provided with enclosed dust proof oil or pressure gun grease lubrication as best suited for the particular location. Oil lubricated bearings shall be of the self-oiling type. Bearings requiring pressure gun grease shall be fitted with Alemite, or approved equal, pressure gun fittings. Chain drives are to be fitted with suitable drip type oilers.

An approved type of hand operated pressure gun of approximately 1-quart capacity and with suitable connections for use on grease fittings used shall be furnished to the Inspector at the site.

Fuel System -- The fuel system shall consist of a gasoline tank of not less than 15 gallons capacity, suitably located and rigidly attached to frame, of either gravity, mechanical fuel pump, or vacuum tank, including strainers and all necessary pipes and accessories. A flexible gasoline line connection shall be provided from the gasoline tank to the solidly anchored line and from the solidly anchored line to the carburetor. An oil type filter or plain dry type air filter using either felt or sponge rubber shall be provided. Fuel to carburetor shall pass through a glass bowl type water and sediment trap.

The carburetor shall be of standard manufacture. The carburetor throttle shall be controlled by an enclosed fly ball type of governor having a speed adjustment on the governor by means of a hand lever on instrument panel and so arranged that it will be sensitive for any speed from the lowest at which engine is capable of maintaining not less than 350 pound-feet torque to at least 25 per cent above its rated r.p.m. The governor shall be similar to that used on the John Deere Model D tractor or approved equal.

An approved type of air cleaner shall also be provided.

Clutch -- The torque capacity of the clutch shall be the maximum torque developed by the engine. The clutch shall be an enclosed dry plate type with provision for hand operation. A spring snap lock shall be provided for holding the hand clutch lever in either the engaged or neutral position. The clutch throw-out and throw-out shaft bearings shall be provided with suitable means of lubrication.

Transmission -- The transmission shall be of the selective, constant mesh, or sliding gear type having machine-cut, heat-treated gears of high-grade steel. It shall be of sturdy construction and the input torque capacity shall be at least the maximum torque developed by the engine. It shall be of such design as to provide not less than five speeds forward and two speeds reverse. High gear shall be direct drive through the transmission giving a ratio of 1 to 1.

Electrical Equipment -- The car shall be provided with complete electric starting and ignition system, amply provided with safety and regulatory devices. All control switches to be within easy and convenient reach of the operator. Battery to be in conformity with current Federal Specification W-B-131, of not less than 160 ampere hours at a 20-hour rate.

Speed Reduction and Chain Power Transmission -- The drive shaft from the engine and transmission shall be extended through a flexible coupling by a shaft mounted upon anti-friction bearings in such a manner that a standard silent type multi-link chain drive can be connected to the cross frame shaft. This cross frame shaft shall be likewise mounted upon anti-friction bearings in such a manner that any warping of the main frame will not set up undue friction.

The power transmission from the cross frame shaft to the jack shafts and in turn to the wheel axles shall be either multi-link silent type chain or standard roller chain. The secondary shafting and axles shall be mounted upon anti-friction bearings suitable for their respective installations. In order to reduce the overall weight of the car and to have a unit construction, the secondary shafts and axles are to be fitted between the structural members of the main frame. Bearing housings and structural members are to be so arranged and necessary welded reinforcement ribs provided to insure alignment of all axles. It must be borne in mind that off center drawbar loads will put excessive strains on the members holding the axles, therefore adequate reinforcement must be installed.

All chain drives and sprockets shall be standard design and of highest commercial grade suitable for the installation with ample allowance as a safety factor. The speed ratios of the respective drives shall produce the speeds as specified. The plan is shown conventional so that the contractor will have a wider range for parts selection. The design and method of installation shall meet the approval of the manufacturer of the chain and finally the approval of the Bureau. All sprockets shall be adequately keyed and locked to their respective shafts. The entire drive installation shall be designed to have a minimum of back lash and means of tightening the chains. Shaft centers may be varied slightly so that no half links need to be installed.

All roller chain drives as specified in any part of this contract shall be provided with an approved type of tightener and shall be covered with sheet metal housings to protect them from dust and dirt. Drip oilers are to be provided for their lubrication.

Sheet metal housings for roller chain drives shall be of not less than No. 24 gauge plain metal, shaped to fit the location, and attached to the car frame in a substantial manner and shall be arranged so as to permit of ready inspection and repairs.

Brakes -- The contractor shall furnish brakes of adequate size to serve as service brakes for this unit. The brakes may be either mechanical, hydraulic, or air operated internal expanding type. One large brake may be mounted on the cross frame shaft or the contractor may use 2 brakes by mounting one on each jackshaft. The service brake shall be of ample capacity to stop the Power Car from a speed of 8 miles per hour in 5 feet with the clutch disengaged. The brake shall be controlled by a foot lever located convenient to the operator in his seat near the instrument panel.

An emergency brake of ample size shall also be provided on the main drive shaft controlled by means of a positive locking hand lever operative from the operator's seat on main frame.

The attachment and location of the automatic brakes must be so arranged as to prevent interference to other parts of the Power Car.

Bearings for mounting of the axles and the drive shafts shall be anti-friction, roller or ball, self-aligning, enclosed in suitable oil and dust proof housings and mounted on the main frame. All other bearings, unless otherwise specified, shall be anti-friction roller or ball bearings suitable for location where used. Bearings shall be approved by the manufacturer for the service required and shall be finally approved by the Bureau.

Axles and shafting, unless otherwise specified, shall be of cold rolled steel designed for a tensile strength of not less than 75,000 pounds per square inch and of ample size, quality and strength suitable for the location.

The angle of twist between corresponding points on wheels on opposite sides of the car shall be kept to a minimum.

Wheels and Tires -- Wheels on main frame shall be of the pressed steel, malleable-iron or ventilated disk type similar to those used on standard makes of heavy motor trucks, and so mounted on standard hub as to have a low overhang on axles. Wheels shall be set on rail centers.

Tires shall be of the high pressure, heavy duty, extra-ply, pneumatic type, size 34 x 7 inches, and shall have a guaranteed rated capacity of 2800 pounds under an air pressure of 100 pounds per square inch. Tires shall conform to the requirements of Federal Specification ZZ-T-381a.

Tubes shall properly fit the tires specified and shall conform to the requirements of Federal Specification ZZ-T-721a.

Wheels on the super frame shall be flanged of a standard industrial type of grey cast iron with chilled tread and flange or standard railroad pressed steel type, designed to operate on upper flange of

10 inch 25.4 pound beam rails as indicated. Wheels shall be 6 inch in diameter designed for a radial load of 1000 pounds and shall be pressed and keyed to shafts and provided with approved anti-friction bearings. Treads and inside of flange shall be machined to true flat surfaces. Shafting shall be of cold-rolled steel having a minimum tensile strength of 75,000 pounds per square inch.

Thrust wheels on super frame shall be solid cast steel or cast iron with chilled treads. Treads shall be beveled to slope of flange. Wheels shall be mounted on steel shafts and provided with anti-friction roller bearings.

Guide wheels shall be of the industrial truck type with either solid rubber or canvas cushion treads. Wheels shall be provided with oil-tight, dust-proof, anti-friction bearings.

Guide Wheels -- As indicated on drawings, four groups of guide wheel assemblies shall be provided to hold the Power Car in place on the "H" beam rails and to counteract the side thrusts produced on the car due to off-center drawbar loads. Each guide wheel assembly shall be designed so as to permit of adjustment in either the extended or retarded position by means of a suitable crank arm as indicated. When car is operating the guide wheel assemblies are to be in the extended position thus increasing the effective wheel base. When not in use the guide wheels are to be in the retarded position as shown on sheet C-1 of 7.

Adjustable connections shall be provided for locking the guide wheels in either position. The adjustment shall be sufficient to compensate for wear on tires or unevenness of rails. Wheels may be held in the extended position by means of bolts as indicated, or by other approved means. Wheels shall be so mounted as to be held in alignment, to allow of pivoting on the crank arm and to clear rail clamps by at least one inch. Rail clamps extend 2-1/2 inches above and 3 inches outside of the lower flange of "H" rails.

Controls, Instrument Panel, Etc. -- The contractor shall provide a suitable swivel-type seat for the car operator in front of the instrument panel, conveniently located to permit operator to operate all controls and to have a clear view of ends of rails and of the dynamometer operator. Seat shall be of pressed steel of standard tractor type design securely mounted on wood platform by metal pedestal with flanged base. All controls on panel are to be hand operated. On the instrument panel are to be mounted the ignition switch, engine starting switch, tachometers, governor control lever, ammeter, choke, oil gauge, and speedometer.

Hand levers operating the gear shift, emergency brake and clutch shall be provided and conveniently located for operation from the car operator's seat. Service brakes shall be foot operated also from the operator's seat.

Control rods, pressure tubes, wires, etc., from engine to instrument panel shall be adequately protected. The speedometer shall be driven from drive shaft on rear of transmission.

Suitable waterproof canvas coverings, for protection against weather when car is not in use, shall be provided for instrument panel and car operator's seat.

Recording Unit Drive Mechanism -- The chart drive transmission shall be driven from axle shaft by a silent type chain drive. The transmission gearing shall be so arranged as to place shaft XX in a position for free operation of the superframe. Gearing shall consist of standard change gears as shown and provided with a double throw jaw clutch for control of the direction of chart rotation.

Shaft XX shall be square, size as shown, and so located that the superframe and all chart drive gearing shall move smoothly along the shaft. Gear on shaft XX shall be provided with hubs, spacers or other approved means to keep it in alignment with its companion pinion as indicated on Section AA, Sheet C-4. The contractor may increase the size of shaft XX to insure a satisfactory unit with the approval of the Bureau but at no additional expense to the Government.

Shafting and gears on superframe for connecting the recording unit to the XX shaft shall be arranged as indicated on drawings. Pairs of bevel gears shall be of 1 to 1 ratio. Enclosed oil and dust-proof housings shall be provided for all gears. The shaft driving the recording unit chart drive shall be extended to end of superframe, as shown, and fitted at outer end with a standard keyway 3 inches long. The recording unit (not included in this contract) will be located on superframe where indicated.

Distance Indicator Circuit Breaker -- The indicator shown on drawings consists of an industrial type steel wheel with solid rubber tire mounted on a steel axle connected to main frame through two bearings and having a steel ball and point contact arrangement at each revolution of the wheel with an outer circumference of the tire of 60 inches. All contacts to be chromium plated steel. Suitable terminals are to be provided and a condenser across the breaker points. No wiring needs to be provided from the terminals.

PAINTING

General--The exposed surfaces of all steel and metal work, equipment, etc., and all parts of the power car, unless otherwise specified, shall be cleaned and painted two coats of aluminum paint in addition to the priming coat. All structural metal shall be cleaned free from scale, rust and all foreign matter and, after inspection, shall be given a shop coat of red lead and oil paint. Surfaces in contact or inaccessible after assembling shall be painted 2 coats before assembling. Machine finished surfaces shall be protected from corrosion.

The exhaust manifold, exhaust pipe and muffler shall be painted with two coats of best quality black metallic paint, suitable for hot surfaces, applied at the shop, in addition to the two finish coats of aluminum paint.

Cables on cranes are not to be painted but shall be thoroughly oiled in a manner as recommended by the manufacturer.

Axles, shafting and similar finished surfaces shall be given 2 coats of an approved make of machinery enamel.

All exposed surfaces and edges of the wood platforms shall be given 2 coats of aluminum paint.

After erection and assembly of the car on the tracks at the site, all field connections and all abraded places shall be touched up and given one additional coat of aluminum paint.

Materials -- All painting materials shall be of approved manufacture. Red lead shall conform to Federal Specification TT-R-191, (95% grade); Raw linseed oil to Federal Specification JJJ-O-336; and Turpentine to Federal Specification LLL-T-791.

Aluminum paint shall be composed of two (2) pounds of aluminum powder to one gallon of oil varnish specially prepared for use in aluminum paint.

Red lead paint shall be mixed in the proportion of 25 pounds dry red lead to 1 gallon raw linseed oil and 1/2 pint of turpentine.

Farm Tillage Machinery Laboratory
Power Car
Auburn, Alabama.
Federal Project - 92

B. A. Eng! - F. P.-92

BID SCHEDULE

The following is the itemized bid:

Item No.		Amount Bid
1.	Construction of Power Car, complete in accordance with the plans and specifications	

Before preparing this proposal, Bidders are cautioned to read carefully the provisions of Form PWA-51 and "Instructions to Bidders" in Bulletin PWA-51, enclosed herewith.

The award will be made to the lowest responsible bidder as one contract.

In order to determine the lowest possible bid, the Government reserves the right to call for statements and other information to show whether the bidder involved (a) maintains a permanent place of business; (b) has adequate plant equipment to do the work properly and expeditiously; (c) has a suitable financial status to meet obligations incident to the work; (d) has appropriate technical experience.

In order to determine whether or not the equipment each bidder plans to supply under his bid schedule will be satisfactory and acceptable to the Bureau the bidder is required to submit the following information with his bid:

A. ENGINE

A-1 Make _____ Model _____

A-2 Number of cylinders _____

A-3 Cubic inch piston displacement _____

A-4 Maximum brake H.P. _____ at _____ r.p.m.

A-5 Maximum torque, net _____ pound feet.

A-6 Number of main bearings _____

A-7 Projected area of main bearings _____

A-8 Governor.--Make _____ Model _____

A-9 Air cleaner--Make _____

B. CLUTCH

B-1 Make _____; Model _____:

B-2 Type _____; Capable of transmitting a
torque to the limit of the coefficient of friction _____
_____ pound feet.

C. TRANSMISSION

C-1 Make _____ Model _____

C-2 Maximum input torque capacity _____ pound feet.

C-3 Number of forward speeds _____

C-4 Gear ratio: First _____; Second _____;
Third _____; Fourth _____;

C-5 Material and type of heat treatment of gears _____

C-6 Bearing sizes _____
" types _____

D. BRAKES

D-1 Make _____; Types _____

D-2 Braking Area

a. Emergency _____ Type of lining _____

b. Service _____ Type of lining _____

E. UNIVERSAL JOINTS--Make _____ Type _____

F. WHEELS _____

F-1 (Drive) Make _____

F-2 (Guide) Make _____

F-3 (Superframe) Make _____

F-4 (Distance indicator) Make _____ Type _____

G. AXLES--Type of steel_____

H. BEARINGS--_____

H-1 (Axle) Make _____Type_____

H-2 (Distance indicator wheel) Make _____Type_____

H-3 ("XX" shaft) Make _____Type_____

H-4 (Guide wheels) Make _____Type_____

H-5 (Other) Make _____Type_____

I. PNEUMATIC TIRES--Make _____No plies_____

J. ROLLER CHAINS--Make _____Sizes_____

K. SPROCKETS--The bidder shall indicate sizes and types of sprockets for each drive at the bottom of the page.

L. STARTING AND IGNITION SYSTEM--Make _____Type_____

M. BATTERY--Make _____capacity_____ampere hours.

N. SILENT CHAIN--Make _____Size_____

O. TACHOMETER--Make _____Model_____

P. DISTANCE INDICATOR--Make _____Model_____

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